UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
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RE: Review of the Final Responses to EPA's Comments on the ST012 Remedial Action Field Variance Memorandum 6 – Pilot Study Supplemental Data and Evaluation Metrics and ST012 Remedial Action Field Variance Memorandum 7 – Pilot Study Implementation – Injection-Extraction Modifications, Former Williams Air Force Base, Mesa, Arizona, July 1, 2019

Dear Ms. Jerrard:

EPA has reviewed the responses to comments provided in our December 12, 2018 letter regarding the field variance memorandum for the implementation of a pilot test of enhanced bioremediation at Williams ST-12.

When EPA agreed to commence with sulfate injections last year it was with the understanding that additional monitoring wells would be installed within 6 months of commencement of sulfate injections to ensure injections would not displace and cause further migration of contaminant plumes. Currently, we are nearing the end of the initial phase of sulfate injections, and nearly a year later, the additional monitoring wells we requested have not yet been installed. In the interim, we have seen significant benzene increases in wells CZ23 and UWBZ 38 to concentrations above the drinking water standard. These wells were previously considered to be outside of the ST12 groundwater plume. Whether these results are due to advection or displacement, the results cast doubt upon the current stability of the plume. EPA's review of AF's responses to comments are provided below.

Evaluation of the Responses to General Comment (GC) 1 first paragraph, GC 3, and Specific Comment (SC 6): *The original intent of the comment expressed concerns that extraction wells would be pulling water from outside the radius of influence and data from these locations would not be representative of static conditions elsewhere in the plume, yielding inconclusive results for the pilot test. The AFs response states "the response to this comment has previously been provided," but does not reiterate or explain the rationale for the response.*

Without a specific reference to the set of responses to comments (RTCs) it is unclear where this information was provided. In the future, RTCs should reference the document to which the RTCs apply and the date the RTCs were submitted to the Environmental Protection Agency (EPA). The responses also states that wells between injection and extraction wells are "not required"; however, these wells may be necessary in the future if sulfate does not reach extraction wells or if plume containment is not

achieved. Discussions regarding the need for wells between injection and extraction wells should continue. For RTCs submitted to EPA in the future, please reference the applicable document and the date when the RTCs were submitted.

Evaluation of the Response to GC 1, second paragraph: *The original comment recommends adding existing wells UWBZ17 and LSZ 35 to the monitoring plan. The AF response suggest this will be taken under consideration.*

The response partially addresses the comment. It is unclear if wells UWBZ17 and LSZ35 will be sampled regularly. Please ensure wells UWBZ17 and LSZ35 are added to the monitoring program for regular sampling.

Evaluation of the Response to GC 4: *The original comment reiterates the need for hydraulic containment to prevent a down gradient plume from the source area. The response declares that hydraulic containment is not in the RDRA workplan.*

The response does not address the comment. Hydraulic containment was extensively discussed during the informal dispute and AF committed to ensuring hydraulic containment for the site in Field Variance 5 of the work plan. Hydraulic containment is a necessary and an implied part of the Pilot Study so that contamination is not displaced, resulting in additional areas of the plume that will require treatment in the future. Note that if contamination is displaced by the injections, the sulfate will not "catch up" with displaced contamination. It appears that displacement may already be occurring, based on the benzene data presented in the July 2019 Base Realignment and Closure (BRAC) Cleanup Team (BCT) presentation, Slides 37-38 and 40-41. Specifically, in June 2019 in the cobble zone (CZ), benzene was detected at 3.0 micrograms per liter (µg/L) in ST012-CZ24, which has been non-detect since 2017. This indicates that the plume has expanded about 160 feet to the east, compared to the plume extent depicted on Figure 3-2, ST012 CZ Modified Injection-Extraction Areas, of the ST012 Remedial Action Field Variance Memorandum 7 – Pilot Study Implementation – Injection-Extraction Modifications, November 9, 2018 (FV7). Similarly, the benzene concentration in Upper Water Bearing Zone (UWBZ) well ST012-UWBZ38 has increased by more than an order of magnitude and was 5.4 µg/L in June 2019. This also represents a 160-foot expansion in the size of the benzene plume, based on the location of this well in relation to the plume extent depicted on Figure 3-3, ST012 UWBZ Modified Injection-Extraction Areas, in FV7. The benzene concentrations in these wells must be monitored – if concentrations continue to increase, additional monitoring and extraction wells will be necessary to evaluate the extent of the plume and to contain it. Please provide trend graphs for benzene concentrations in these wells in future presentations to the BCT so that the BCT can evaluate whether additional extraction and/or monitoring wells are necessary.

Evaluation of the Response to SC 5: *The original comment requested additional BioTrap samples beyond the collected 2 samples per zone, and the samples that were collected were outside of the benzene plume.*

The response was noncommittal and did not address the comment. Wells that are sampled using BioTraps in the CZ should be located within the benzene plume. Otherwise, the quantitative polymerase chain reaction (qPCR) results are not meaningful. In addition, sampling only two wells in each zone is insufficient to evaluate microbial populations throughout the plume. Please collect samples for qPCR analysis from several wells located within the benzene plume in the CZ and evaluate where additional samples for qPCR analysis should be collected in each zone in the future. EPA is concerned that the pilot test is not collecting sufficient data to draw conclusions on the efficacy of EBR to meet the RODA objectives.

Evaluation of the Response to SC 7: *The original comment recommended a more proactive approach to evaluating and responding to changes in nutrient loading.*

The response partially addresses the comment. The response does not discuss how "diminished sulfate reducing activity" will be assessed given the heterogeneity across the site. Also, it is unclear how the approach outlined in ST012 Remedial Action Field Variance Memorandum 6 – Pilot Study Supplemental Data and Evaluation Metrics, dated November 14, 2018 (FV6) is proactive when it is a reaction to results, instead of anticipating the need to add nutrients to sustain microbial growth. Please discuss how diminished sulfate reducing activity will be accessed in heterogeneous conditions and explain in detail how FV6 is proactive.

Evaluation of the Response to SC 9: *The original comment pointed out that the location of injection/extraction wells are not well placed to deliver sulfate to areas of highest benzene concentrations.*

The response partially addresses the comment. It does not acknowledge that in order to address the high concentration of benzene in the vicinity of ST012-UWBZ30, an extraction well farther downgradient is needed or that the actual extent of high-level contamination in the vicinity of this well is unknown. For example, the Regulatory Agencies proposed UWBZ location 5 to delineate the extent of contamination. This well is needed to evaluate the extent of high concentration benzene, even though benzene has been detected in downgradient location ST012 -UWBZ38 at 5.4 µg/L. Please install proposed UWBZ location 5 as soon as practicable.

Evaluation of the Response to SC 11: *The original comment raises concerns about quality and representativeness of reported data in the parameters table; the response acknowledges wide variability of parameters across the site.*

The response partially addresses the comment. Although there are other parameters for determining if the subsurface conditions are optimal for biological degradation, the field meter should be calibrated regularly to ensure that dissolved oxygen (DO) measurements are accurate. If it cannot be calibrated, it should be replaced. Also, if a DO measurement exceeds the solubility limit, then the sample should be retested. If this problem persists, the meter should be recalibrated. If it cannot be calibrated, then it should be replaced. Please ensure that field procedures are revised to ensure a functioning DO meter is in place and that a replacement unit is available on-site.

The RTC states, "There are a significant number of other geochemical parameters and chemical parameters presented in the Decision Matrix that will be available and considered in the decision making process." However, data for 'these other parameters' since injections have been initiated have not been presented to the agencies, thus it is not clear that this data is being collected and evaluated. Please ensure that all data is provided to the agencies.

Evaluation of the Response to SC 12: *The original comment noted consistently high dissolved oxygen levels in multiple wells; the response suggests the data is "qualitative" and not consistent with other observations of sulfate reduction in the system.*

The response partially addresses the comment. Additional supporting information is needed to support the statement that the DO data is not reliable (e.g., measurement method). If the DO is elevated, anaerobic degradation will not occur and the necessary microorganisms will be stressed or killed. Since aerobic petroleum-degrading microorganisms are not present in sufficient quantities based on the re-baseline data, conditions in the subsurface need to be anaerobic, but the response did not explain how

anaerobic conditions will be obtained so that petroleum and benzene are degraded. Please explain why DO data is not considered reliable and discuss how anaerobic conditions will be achieved in areas where the DO is elevated.

Evaluation of the Response to SC 13, first paragraph: *The original comment expressed concern for plume stability, which the response rejects.*
Much of this response has been overcome by events because extraction has begun at ST012-CZ23; however, it is incorrect to state that plume expansion in the UWBZ is limited. Based on the June 2019 data, the benzene plume in the UWBZ has expanded beyond ST012-UWBZ38, where benzene was detected at 5.4 µg/L, which is more than an order of magnitude increase over previous detections. Please update the response.
The response also states, "site monitoring provides evidence that the magnitude of benzene upgradient of the area is diminishing." The benzene data on slide 26 of the August BCT presentation does not support this statement. While the concentration at CZ07 appears lower, the benzene concentrations at CZ09 and CZ08 are stable or increasing. Please ensure that the response considers these concentration trends.

Evaluation of the Response to SC 14: *The original comment referenced a BCT presentation slide and expressed concerns for downgradient plume expansion, which the response rejects, without providing supporting documentation.*
The response has been overcome by events. Specifically, it the statement on Slide 18 of the October 2018 BCT presentation that the extent of the benzene plume is not changing over time is no longer true. Specifically, the benzene plume in the CZ and UWBZ has migrated downgradient approximately 160 feet to ST012-CZ24 and ST012-UWBZ38, respectively. Aerobic degradation mechanisms at the former downgradient edge of the plume are no longer effective, and the plume appears to be migrating in these two zones, based on data from June 2019. The increasing benzene concentrations in these wells must be monitored regularly and trend graphs of benzene concentrations in these wells must be included in future BCT presentations so that the BCT can decide if additional actions are necessary. Please ensure that samples for volatile organic compound (VOC) analysis are collected from ST012-CZ24 and ST012-UWBZ38 and that future BCT presentations include trend graphs so that the BCT can monitor trends in these wells.

In summary, the recent observations of increasing benzene concentrations in perimeter wells are cause for concern, and further evaluation of the current extent of contamination is warranted. While EPA understands the contractual delays have been beyond the control of the Air Force (AF), we consider completion of well installations to be urgently needed, and the delay could ultimately result in the need for more wells beyond the 10 originally requested. EPA appreciates whatever effort can be made to expedite the well installation and clearly define and characterize the contours of the plume.

Sincerely

Carolyn d'Almeida

Carolyn d'Almeida
Remedial Project Manager

cc: Wayne Miller, ADEQ